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# IDENTIFICATION OF PROTECTED AQUATIC BIOTA CAUGHT (BY CATCH) AND LANDED AT BRONDONG ARCHIPELAGO FISHING PORT, LAMONGAN, INDONESIA

Identifikasi Biota Perairan Dilindungi yang Tertangkap (*Bycatch*) dan Didaratkan di Pelabuhan Perikanan Nusantara Brondong, Lamongan, Indonesia

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## ABSTRACT

Indonesia is a country with exceptionally high biodiversity and endemism. However, this condition also increases the risk of overfishing, which can lead to population declines and even species scarcity. In practice, fishing activities often capture non-target organisms (bycatch), including marine species with important conservation status listed in the International Union for Conservation of Nature (IUCN) Red List and the appendices of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). Therefore, conservation efforts for sharks and rays are crucial due to high fishing pressure, including bycatch, as well as their low reproductive rates, which make them particularly vulnerable to extinction. The use of non-selective fishing gear further increases the likelihood of accidental capture, highlighting the need for sustainable fisheries management, fisher education, and bycatch reduction measures. This study focuses on protected aquatic biota to obtain data on sharks and rays landed at the Brondong Nusantara Fishing Port. Data were collected through direct observation of protected species landed at the port. The results show that several species are listed under CITES Appendix II, including *Rhynchobatus springeri, Sphyrna zygaena, Carcharhinus dussumieri, Carcharhinus melanopterus, Carcharhinus limbatus*, and *Rhina ancylostoma*. Additionally, several species are included in the IUCN Red List, such as *Telatrygon zugei, Ginglymostoma cirratum, Galeocerdo cuvier, Dasyatis zugei, Chiloscyllium punctatum, Himantura uarnak, Mustelus manazo, Aetobatus ocellatus, and Chiloscyllium plagiosum*. This identification and documentation are essential for determining conservation status and supporting policies aimed at balancing utilization and conservation of shark and ray resources in Indonesia.

**Keywords**: Bycatch, Conservation, IUCN, Shark, Stingray

**ABSTRAK**

Indonesia merupakan negara dengan tingkat keanekaragaman hayati dan endemisme yang sangat tinggi. Namun, kondisi ini juga meningkatkan risiko penangkapan ikan berlebih (*overfishing*) yang dapat menyebabkan penurunan populasi hingga kelangkaan spesies. Dalam praktiknya, kegiatan penangkapan ikan seringkali turut menangkap organisme non-target (*bycatch*), termasuk biota laut dengan status konservasi penting menurut daftar merah *International Union on Conservation of Nature* (IUCN) dan appendix *Convention on International Trade in Endangered Species of Wild Fauna and Flora* (CITES). Upaya konservasi hiu dan pari menjadi sangat penting mengingat tingginya tekanan penangkapan, termasuk *bycatch*, serta rendahnya laju reproduksi yang membuat spesies ini rentan terhadap kepunahan. Penggunaan alat tangkap yang tidak selektif juga memperbesar kemungkinan tertangkapnya hiu dan pari secara tidak sengaja, sehingga diperlukan pengelolaan perikanan berkelanjutan, edukasi nelayan, serta upaya pengurangan *bycatch*. Oleh karena itu, penelitian terhadap biota perairan dilindungi perlu dilakukan untuk memperoleh data terkait hiu dan pari yang tertangkap di Pelabuhan Perikanan Nusantara Brondong, Indonesia. Pendataan dilakukan secara langsung terhadap biota yang didaratkan. Hasil kajian menunjukkan adanya spesies yang termasuk Appendix II CITES seperti *Rhynchobatus springeri*, *Sphyrna zygaena*, *Carcharhinus dussumieri*, *Carcharhinus melanopterus*, *Carcharhinus limbatus*, dan *Rhina ancylostoma*. Selain itu, beberapa spesies juga teridentifikasi dalam IUCN Red List, antara lain *Telatrygon zugei*, *Ginglymostoma cirratum*, *Galeocerdo cuvier*, *Dasyatis zugei*, *Chiloscyllium punctatum*, *Himantura uarnak*, *Mustelus manazo*, *Aetobatus ocellatus*, dan *Chiloscyllium plagiosum*. Pendataan dan identifikasi ini penting sebagai dasar penentuan status konservasi serta mendukung kebijakan pengelolaan yang menyeimbangkan antara pemanfaatan dan konservasi sumber daya hiu dan pari di Indonesia.

**Kata Kunci**: *Bycatch*, Hiu, Pari, IUCN, Konservasi

## INTRODUCTION

Indonesia boasts a very high level of biodiversity and endemism, making it a mega-biodiversity nation. This rich biodiversity is an asset for the nation's development and prosperity, as a significant portion of national development relies on biodiversity. Aquatic biota comprises all living organisms in the sea, both plants and animals. Aquatic biota, considered part of marine biodiversity, require protection to prevent extinction, which could negatively impact life.

Marine resources are open to access, leading to neglect of their sustainability, as people assume they are free to exploit existing resources without control. This risks overfishing, leading to the depletion of fish populations. Fishing activities often catch non-target organisms, including marine life with critical conservation status according to the International Union on Conservation of Nature (IUCN) Red List and the appendix of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). Fishermen's catches tend not to be based on the availability of scientific information and data regarding the conservation status of important marine biota, resulting in continued population declines for these species as a result of fishing activities (Permana & Azizah, 2022).

Sharks and rays are species whose catch is often referred to as bycatch. Bycatch is catch that is not the primary target. Bycatch can be obtained from the use of fishing gear that has the potential to cause bycatch. Sharks command a high selling price, especially for their fins, and there are markets that accept bycatch. According to fishermen, sharks and rays caught bycatch can increase their income and, if consumed, maintain health (Tebaiy et al., 2022).

Shark and ray fishing has been ongoing in Indonesia for a long time, and concerns about the threat to these biota are not unique to Indonesia but are global. Conservation efforts are

needed, encompassing aspects of preservation, protection, and utilization. Biodiversity in Indonesian waters is a tangible and intangible asset for the development and prosperity of the nation, such as the existence of elasmobranchii as a protected marine biota that is often found in Indonesian waters. Protected aquatic biota is important to study because considering the increasing number of endangered, rare and endemic aquatic biota, it is necessary to give special attention and priority in conservation and protection efforts. Socialization regarding protected marine biota needs to be realized so that a sense of care, willingness, and knowledge about aquatic biota and marine wealth can be maintained so that their survival can be maintained. Therefore, research related to protected aquatic biota needs to be carried out to obtain information regarding data on sharks and rays caught at the Brondong Nusantara Fisheries Port (Bawole & Megawanto, 2017).

## RESEARCH METHODS

Data were obtained through direct observation of protected biota species in the catch landed at the Brondong Nusantara Fisheries Port (PPN), Lamongan, Indonesia. Data collection was conducted on the classification of protected biota caught. Identification of shark and ray species was carried out using journals and books and the website https://www.gbif.org/occurrence/4519156543. Conservation status was identified using the official IUCN website (www.iucnredlist.org). The estimated fishing area map is displayed based on a location map processed using ArcGIS 10.8.


Figure 1. Research sampling location

## RESULT

The shark and ray species landed at Brondong PPN were all intact. The population status of each shark species found is listed on the International Union for Conservation of Nature (IUCN) Red List. The IUCN Red List status is divided into five levels: near threatened, vulnerable, endangered, critically endangered, extinct in the wild, and extinct. These levels are based on the condition and presence of specific specimens in the wild. The shark and ray species landed at Brondong PPN are also listed in Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). Species included in Appendix II are species that are not currently threatened with extinction but could become endangered in the future if trade continues without regulation. The identification results of the shark and ray species landed at Brondong PPN can be seen in Table 1.

Table 1. Identification Results of Shark and Ray Captured (by catch)

| No | Klasifikasi | Gambar | Status Konservasi | |
|---|---|---|---|---|
| | | | CITES | IUCN |
| 1. | Maskry ray (*Neotrygon orientale)*<br>Kingdom: Animalia<br>Phylum : Chordata<br>Class : Elasmobranchii<br>Order : Myliobatiformes<br>Family : Dasyatidae<br>Genus : *Neotrygon* Castelnau, 1873<br>Species : *Neotrygon orientale* Last, White & Serét, 2016 |  | Not Evaluated | *Less Concern* (LC) (Sherman et al., 2022) |
| 2. | Chuckled ray(*Rhynchobatus springeri)*<br>Kingdom: Animalia<br>Phylum: Chordata<br>Class: Elasmobranchii<br>Order: Rhinopristiformes<br>Family: Rhinidae<br>Genus: *Rhynchobatus* Müller & Henle, 1837<br>Species: *Rhynchobatus springeri* Compagno & Last, 2010 |  | Appendix II: International trade monitored | *Critically Endangered* (CR) (Kyne, 2019) |
| 3. | Butterfly ray (*Gymnura micura)*<br>Kingdom: Animalia<br>Phylum: Chordata<br>Class: Elasmobranchii<br>Order: Myliobatiformes<br>Family: Gymnuridae<br>Genus: *Gymnura* van Hasselt, 1823<br>Species: *Gymnura micura* (Bloch & Schneider, 1801) |  | Not Evaluated | *Near Threatened* (NT) (Dulvy et al., 2021) |

| | | | | |
|---|---|---|---|---|
| 4. | Pointed-nosed stingray (*Telatrygon zugei)*<br>Kingdom: Animalia<br>Phylum: Chordata<br>Class: Elasmobranchii<br>Order: Myliobatiformes<br>Family: Dasyatidae<br>Genus: *Telatrygon* Last, Naylor & Manjaji-Matsumoto, 2016<br>Species: *Telatrygon zugei* (Müller & Henle, 1841) |  | Not Evaluated | *Vulnerable* (VU) (Rigby, Chen, et al., 2021) |
| 5. | Nurse shark (*Ginglymostoma cirratum)*<br>Kingdom: Animalia<br>Phylum: Chordata<br>Class: Elasmobranchii<br>Order: Orectolobiformes<br>Family: Ginglymostomatidae<br>Genus: *Ginglymostoma* Müller & Henle, 1837<br>Species: *Ginglymostoma cirratum* (Bonnaterre, 1788) |  | Not Evaluated | *Vulnerable* (VU) (Carlson et al., 2021) |
| 6. | Bamboo Shark (*Chiloscyllium plagiosum)*<br>Kingdom: Animalia<br>Phylum: Chordata<br>Class: Elasmobranchii<br>Order: Orectolobiformes<br>Family: Hemiscylliidae<br>Genus: *Chiloscyllium* Müller & Henle, 1837<br>Species: *Chiloscyllium plagiosum* (Anonymous & Bennett, 1830) |  | Not Evaluated | *Not Threatened* (NT) (Kyne et al., 2021) |

| | | | | |
|---|---|---|---|---|
| 7. | Hammerhead shark (*Sphyrna zygaena*)<br>Kingdom: Animalia<br>Phylum: Chordata<br>Class: Elasmobranchii<br>Order:Carcharhiniformes<br>Family: Sphyrnidae<br>Genus: *Sphyrna* Rafinesque, 1810<br>Species: *Sphyrna zygaena* (Linnaeus, 1758) |  | Appendix II: International trade monitored | *Vulnerable* (VU) (Rigby et al., 2019) |
| 8. | *Small spotted catshark* (*Scyliorhinus canicula)*<br>Kingdom: Animalia<br>Phylum: Chordata<br>Class: Elasmobranchii<br>Order:Carcharhiniformes<br>Family: Scyliorhinidae<br>Genus: *Scyliorhinus* Blainville, 1816<br>Species: *Scyliorhinus canicula* (Linnaeus, 1758) |  | Not Evaluated | *Less Concern* (LC) (Finucci et al., 2021) |
| 9. | Bird Ray (*Aetobatus ocellatus)*<br>Kingdom: Animalia<br>Phylum: Chordata<br>Class: Elasmobranchii<br>Order: Myliobatiformes<br>Family: Myliobatidae<br>Genus: *Aetobatus* Blainville, 1816<br>Species: *Aetobatus ocellatus* (Kuhl, 1823) |  | Not Evaluated | *Vulnerable* (VU) (Kyne et al., 2016) |

| | | | | |
|---|---|---|---|---|
| 10. | Flower ray (*Neotrygon kuhlii)*<br>Kingdom: Animalia<br>Phylum: Chordata<br>Class: Elasmobranchii<br>Order: Myliobatiformes<br>Family: Dasyatidae<br>Genus: *Neotrygon* Castelnau, 1873<br>Species: *Neotrygon kuhlii* (Müller & Henle, 1841) |  | Not Evaluated | *Data Deficient* (DD)<br>(Kyne & Finucci, 2018) |
| 11. | Peanut Shark (*Mustelus manazo)*<br>Kingdom: Animalia<br>Phylum: Chordata<br>Class: Elasmobranchii<br>Order: Carcharhiniformes<br>Family: Triakidae<br>Genus: *Mustelus* Linck, 1790<br>Species: *Mustelus manazo* Bleeker, 1855 |  | Not Evaluated | *Endangered* (EN)<br>(Rigby et al., 2020) |
| 12. | Tiger ray (*Himantura uarnak)*<br>Kingdom: Animalia<br>Phylum: Chordata<br>Class: Elasmobranchii<br>Order: Myliobatiformes<br>Family: Dasyatidae<br>Genus: *Himantura* Müller & Henle, 1837<br>Species: *Himantura uarnak* (Gmelin, 1789) |  | Not Evaluated | *Endangered* (EN)<br>(Sherman et al., 2021) |
| 13. | Brown Bamboo Shark (*Chiloscyllium punctatum)*<br>Kingdom: Animalia<br>Phylum: Chordata<br>Class: Elasmobranchii<br>Order: Orectolobiformes<br>Family: Hemiscylliidae<br>Genus: *Chiloscyllium* Müller & Henle, 1837 |  | Not Evaluated | *Not Threatened* (NT)<br>(Dudgeon et al., 2016) |

| | | | | |
|---|---|---|---|---|
| | Species: *Chiloscyllium punctatum* Müller & Henle, 1838 | | | |
| 14. | Lanjaman shark (*Carcharhinus dussumieri)*<br>Kingdom: Animalia<br>Phylum: Chordata<br>Class: Elasmobrancii<br>Order: Carcharhiniformes<br>Family: Carcharhinidae<br>Genus: *Carcharhinus* blainville, 1816<br>Spesies: *Carcharhinus dussumieri* (muller & henle, 1839) |  | Appendix II: International trade monitored | *Endangered* (EN)<br>(Simpfendorfer et al., 2019) |
| 15. | Blacktip reef shark (*Carcharhinus melanopterus)*<br>Kingdom: Animalia<br>Phylum: Chordata<br>Class: Elasmobrancii<br>Order: Carcharhiniformes<br>Family: Carcharhinidae<br>Genus: *Carcharhinus* blainville,1816 |  | Appendix II: International trade monitored | *Vulnerable* (VU)<br>(Simpfendorfer et al., 2020) |
| 16. | Tiger shark (*Galeocerdo cuvier*)<br>Kingdom: Animalia<br>Phylum: Chordata<br>Class: Elasmobrancii<br>Order: Carcharhiniformas<br>Family: Carcharhinidae<br>Genus: *Galeocerdo*, muller & henle, 1837<br>Spesies: *Galeocerdo cuvie*r (Pèron dan Leuseur, 1822) |  | Not Evaluated | *Not Threatened* (NT)<br>(Ferreira & Simpfendorfer, 2019) |

| | | | | |
|---|---|---|---|---|
| 17. | Blacktip shark (*Carcharhinus limbatus)*<br>Kingdom: Animalia<br>Phylum: Chordata<br>Class: Elasmobrancii<br>Order: Carcharhiniformes<br>Family: Carcharhinidae<br>Genus: *Carcharhinus* blainville,1816<br>Spesies: *Carcharhinus limbatus* (muller & henle, 1839) |  | Appendix II: International trade monitored | *Vulnerable* (VU) (Rigby, Carlson, et al., 2021) |
| 18. | Barong fish (R*hina ancylostoma)*<br>Kingdom: Animalia<br>Phylum: Chordata<br>Class: Elasmobrancii<br>Order: Rhinopristiformes<br>Family: Rhinidae<br>Genus: *Rhina*, bloch & schneider 1801 |  | Appendix II: International trade monitored | *Critically Endangered* (CR) (Kyne et al., 2019) |
| 19. | Smooth dog shark (*Mustelus lenticulatus*)<br>Kingdom: Animalia<br>Phylum: Chordata<br>Class: Elasmobrancii<br>Order: Carcharhiniformes<br>Family: Triakidae<br>Genus: Mustelus linck,1790<br>Spesies: *Mustelus lenticulatus*, phillips 1932 |  | Not Evaluated | *Less Concern* (LC) (Finucci & Kyne, 2018) |
| 20. | Javan Stingray (*Dasyatis zugei*)<br>Kingdom: Animalia<br>Filum: Chordata<br>Kelas: Elasmobranchii<br>Ordo: Myliobatiformes<br>Family: Dasyatidae<br>Genus: *Telatrygon* Last, Naylor dan Manjaji Matsumoto, 2016<br>Spesies: *Dasyatis zugei* (Muller dan Henle, 1841) |  | Not Evaluated | *Vulnerable* (VU) (Rigby, Chen, et al., 2021) |

| | | | | |
|---|---|---|---|---|
| 21. | Reef cat shark (*Scyliorhinus hesperius*)<br>Kingdom: Animalia<br>Filum: Chordata<br>Kelas: Elasmobranchii<br>Ordo: Carcharhiniformes<br>Family: Scyliorhinidae<br>Genus: *Scyliorhinus* Blainville, 1816<br>Spesies: *Scyliorhinus hesperius* (Springer, 1966) |  | Not Evaluated | *Less Concern* (LC) (Dulvy & Herman, 2020) |

## DISCUSSION

Based on the identification data, two species of rays are classified as highly endangered, namely (Rhina ancylostoma) and the Kekeh Ray (Rhynchobatus springeri). Both species are listed as Critically Endangered on the IUCN Red List. Critically endangered is given to species facing very high conservation risks in nature. Rhina ancylostoma (Rhinidae), Rhinobatus typus (Rhinidae), and Rhynchobatus australiae (Rhinobatidae) have become targets of fishing and exploitation, resulting in drastic population declines. The Kekeh Ray is also a fish species that is starting to be threatened. Research results in the waters of North Central Java and Bangka waters show that this species of fish is no longer just a bycatch, but has also become a target fish due to high market demand for its fins and meat (Aisyah & Farhaby, 2021). Although nationally, regulations for the utilization of the Kekeh Ray have not been regulated, internationally, the population status of this fish species is considered endangered. Species included in the Endangered (EN) category landed at PPN Brondong include the Kacang Shark (Mustelus monazo), Tiger Ray (Himantura uarnak), and Lanjaman Shark (Carcharhinus dussumieri). There are 7 species included in the vulnerable (VU) category, namely the Sharpnose Ray (Telatrygon zugei), Nurse Shark (Ginglymostoma cirratum), Hammerhead Shark (Sphyrna zygaena), Bird Ray (Aetobatus ocellatus), Blacktip Reef Shark (Carcharhinus melanopterus), Blacktip Shark (Carcharhinus limbatus), and Javan Stingray (Dasyatis zugei). The Vulnerable category is a category given to species considered to face a high conservation risk in nature. This VU category is given to species that have experienced a reduction in population size in a period of less than 10 years. The results of shark research in the waters of South Java to East Java show that the exploitation of hammerhead shark populations continues to increase and will continue to impact the decreasing genetic variation (Prehadi et al., 2015). The government itself has strictly prohibited the export of Sphyrna spp species in any form through the Regulation of the Minister of Maritime Affairs and Fisheries of the Republic of Indonesia Number 5 / PERMEN-KP / 2018 because its existence is starting to be threatened in the wild. There are 4 species that are included in the Near Threatened (NT) category or almost threatened with extinction, namely the Butterfly Ray (Gymnura micura), Bamboo Shark (Chiloscyllium plagiosum), Brown Bamboo Shark (Chiloscyllium punctatum), Tiger Shark (Galeocerdo cuvier). According to the IUCN (2020) Near Threatened is a conservation status given to species that have been evaluated but do not meet the requirements to be included in the endangered or vulnerable category but may experience conservation in the near future. There are 4 species included in the Least Concern (LC) category, including the Maskry Ray (Neotrygon orientale), Small spotted catshark (Scyliorhinus canicula), Smooth dog shark (Mustelus lenticulatus), Reef cat shark (Scyliorhinus hesperius), and there is 1 species in the

Data Deficient (DD) category, namely the Flower Ray (Neotrygon kuhlii). Data Deficient is a conservation status given to species with insufficient information to make an assessment of conservation risk based on their distribution and population status. Based on the research results, it was found that there are 5 species classified in Appendix II, namely the Kekeh Ray (Rhynchobatus springeri), Hammerhead Shark (Sphyrna zygaena), Lanjaman Shark (Carcharhinus dussumieri), Blacktip Reef Shark (Carcharhinus melanopterus), and Barong Ray (Rhina ancylostoma) which means that these species are not endangered but may be threatened when traded sustainably without proper regulations, while other species have not yet been evaluated by CITES (Yuwandana et al., 2020).

Shark and ray conservation efforts are crucial given the high fishing pressure, including bycatch, and the low reproductive rates of these species, which make them vulnerable to extinction (Yudha et al., 2022). Furthermore, the use of non-selective fishing gear contributes to an increase in the number of sharks and rays accidentally caught, necessitating sustainable fisheries management, fisherman education, and bycatch reduction (Theresia et al., 2025). Data collection and identification of captured species are also crucial for determining conservation status based on IUCN and CITES and supporting protection policies (Nurfatimah et al., 2024). Furthermore, shark and ray management in Indonesia needs to be directed at a balance between utilization and conservation, as continued unmanaged exploitation can threaten the sustainability of their populations (Sukmaningrum et al., 2022).

## CONCLUSION

Sharks and rays are species whose catch is often referred to as bycatch. The species (Rhina ancylostoma) and the Kekeh Ray (Rhynchobatus springeri) are both listed as Critically Endangered on the IUCN Red List. Species included in the Endangered (EN) category landed at PPN Brondong include the Kacang Shark (Mustelus monazo), the Tiger Ray (Himantura uarnak), and the Lanjaman Shark (Carcharhinus dussumieri). There are 7 species included in the vulnerable (VU) category, namely the Sharpnose Ray (Telatrygon zugei), Nurse Shark (Ginglymostoma cirratum), Hammerhead Shark (Sphyrna zygaena), Bird Ray (Aetobatus ocellatus), Blacktip Reef Shark (Carcharhinus melanopterus), Blacktip Shark (Carcharhinus limbatus), and Javan Stingray (Dasyatis zugei). There are 4 species included in the Near Threatened (NT) category or almost threatened with extinction, namely the Butterfly Ray (Gymnura micura), Bamboo Shark (Chiloscyllium plagiosum), Brown Bamboo Shark (Chiloscyllium punctatum), Tiger Shark (Galeocerdo cuvier). The smooth-nosed dog shark (Mustelus lenticulatus), the reef cat shark (Scyliorhinus hesperius), and one Data Deficient (DD) species, the reticulated ray (Neotrygon kuhlii), are listed. Five species are listed in Appendix II: the kekeh ray (Rhynchobatus springeri), the hammerhead shark (Sphyrna zygaena), the lanjaman shark (Carcharhinus dussumieri), the blacktip reef shark (Carcharhinus melanopterus), and the barong ray (Rhina ancylostoma).

Conservation efforts for sharks and rays caught as bycatch in the Brondong Lamongan PPN are crucial for maintaining the sustainability of fisheries resources and maintaining a balanced marine ecosystem. The high potential for accidental capture of these species, coupled with their biological characteristics that make them vulnerable to exploitation, demand more prudent and sustainable management. Through the use of more selective fishing gear, increased fisher awareness, accurate catch data recording, and appropriate release-return practices, it is hoped that negative impacts on shark and ray populations can be reduced.

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